METAL AND NONMETAL
INTERIM DIESEL PARTICULATE MATTER (DPM) STANDARD
Compliance Guide Q&As

INTRODUCTION - HOW TO USE THIS PUBLICATION

This document is presented in a question and answer format with the questions asked from the perspective of the mine operator. The terms "standard" and "rule" are interchangeable and mean the same thing in this document.

1. Who should use this publication?

This publication is intended to provide compliance information to underground mine operators, miners, and representatives of miners in metal and nonmetal underground mines that use diesel powered equipment.

2. What is the purpose of this guide?

This compliance guide provides a summary of the key requirements of the Mine Safety and Health Administration's (MSHA's) existing interim standard on Diesel Particulate Matter Exposure of Underground Metal and Nonmetal Miners of January 19, 2001 (66 FR 5706), and amended on February 29, 2002 (67 FR 9180). The standard became effective on July 20, 2002. This guide also contains compliance assistance information to help you meet current requirements of the standard.

HEALTH RISKS

3. What is DPM and why is MSHA regulating it?

DPM is a component of diesel exhaust. DPM includes diesel soot and solid aerosols such as organic carbon compounds, ash, metallic abrasion particles, sulfates and silicates. The majority of diesel exhaust particles are less than 1.0 μm in size. Diesel soot particles have a solid core mainly consisting of elemental carbon, with a wide variety of other substances attached to the surface.

Exposure to high concentrations of diesel particulate matter can result in a variety of serious adverse health effects. These health effects have been found to include: (i) sensory irritations and respiratory symptoms serious enough to distract or disable miners; (ii) premature death from cardiovascular, cardiopulmonary, or respiratory causes; and (iii) lung cancer. The health effects are discussed in the January 2001 preamble to the standard.

SCOPE OF THE INTERIM STANDARD

4. What mine operators will have to comply with this standard?

The standard applies to all operators of underground metal and nonmetal mines that use diesel powered equipment in the underground areas of the mine. This includes certain independent contractors that use diesel powered equipment underground in metal and nonmetal mines.

Independent contractors whose diesel powered vehicles enter underground areas of a mine on a frequent, regular, and recurring basis, or remain inside the mine for a prolonged period of time are covered under the requirements of this standard because such equipment would be considered to be part of the mine's diesel equipment fleet. Examples of such contractors include a mining contractor that has been hired to handle a mine's production haulage using its own haulage trucks, or a blasting contractor that uses its own powder truck to load blast holes at a mine. These vehicles and equipment are used on a regular basis underground, and the contractor's employees as well as the mine operator's employees would be exposed to DPM hazards. MSHA intends that contractor employees be protected from hazards from DPM exposure.

5. Are customer and delivery vehicles covered under the standard?

No. Delivery and customer vehicles are not covered by the requirements of this standard. For example, contractors such as an electrical contractor vehicle that is brought into a mine to install a new power center, or an equipment dealer's service truck that is brought into a mine to maintain a new loader are not covered under the DPM standard. Mine operators may need to restrict emissions from customer vehicles in order to reduce miners' exposures to the PEL.

6. Does the standard apply to gasoline-powered vehicles and equipment?

No. Only diesel powered vehicles and equipment used underground are covered.

7. Does the standard apply to active underground mines that are not in production?

Yes. The standard applies to active underground mines that are in development, undergoing rehabilitation and mines engaged in exploratory activities.

8. Which provisions of the 2001 rule are in effect as of July 20, 2003?

The provisions listed below are in effect now.

§57.5060(a), Concentration limit (interim)
§57.5061, Compliance determinations
§57.5065, Fueling practices
§57.5066, Maintenance standards
§57.5067, Engines
§57.5070, Miner training
§57.5071, Environmental monitoring
§57.5075, Diesel particulate records

9. Which provisions of the rule are not in effect at this time?

The following provisions of the 2001 final rule were stayed on July 18, 2002 pending completion of the new DPM rulemaking:

§57.5060(d), permitting miners to work in areas where the level of DPM exceeds the concentration limit with advance approval of the Secretary;
§57.5060(e), prohibiting use of respiratory protective equipment (respirators) for compliance;
§57.5060(f), prohibiting use of administrative controls for compliance; and,
§57.5062, establishing the DPM control plan.

Provisions of the 2001 final rule scheduled to become effective after January 19, 2006:

These existing provisions relate to the final concentration limit for DPM are listed below:

§57.5060(b), addressing the final concentration limit; and
§57.5060(c), addressing an extension of time in which to meet the final concentration limit.

10. If MSHA is in rulemaking to change the interim standard, why do I have to comply with the existing interim standard that includes total carbon and a concentration limit?

Shortly after the Final Rule on Diesel Particulate Matter Exposure of Underground Metal and Nonmetal Mines was published in the Federal Register in January, 2001, industry challenged the final rule and the United Steelworkers of America intervened in the litigation. In response to the legal challenge, the parties agreed to resolve their differences in negotiations. A first partial settlement formed the basis for the revised rule of February 27, 2002, addressing maintenance and engine provisions of the 2001 rule. The second partial settlement was reached on July 15, 2002, and is the basis for the current rulemaking revising the interim concentration limit. In the DPM settlement agreement, MSHA agreed to conduct compliance assistance from July 20, 2002 through

July 19, 2003. Also, MSHA agreed that after July 19, 2003, the agency would issue citations for failure to comply with the interim standard.

Therefore, MSHA will employ an enforcement policy for the interim concentration limit pursuant to the DPM settlement agreement. MSHA will measure TC by taking a miner's full-shift personal sample. The agency will use elemental carbon (EC) to ensure that a citation based on the 400 micrograms per cubic meter of air limit of TC is valid and not the result of interferences.

11. What will MSHA inspectors look for when they conduct an inspection ?

Inspectors will adapt their inspection activities to the site specific conditions at a given mine, but in general, they will look at the following items:

57.5060(a)--The inspector will evaluate the operation to determine which miners would likely be subject to the highest DPM exposure, and would conduct personal sampling of those miners.

If sampling results indicate that a miner's exposure has exceeded the limit, and if MSHA determines that controls are feasible, MSHA will issue the mine operator a citation for an overexposure. If mine operators choose to take additional samples indicating possible compliance, MSHA will resample with an additional single sample. If the subsequent MSHA single sample demonstrates compliance, the citation will be terminated.

In response to a citation, mine operators may choose to abate the citation by taking routine and usually effective steps, such as improved maintenance, administrative controls, or the implementation of a standard filter program to the extent feasible, to reduce DPM levels. Once the operator's routine and usually effective steps are completed, MSHA will resample at the operator's request to determine compliance, and terminate the citation if exposures are reduced to the permissible exposure limit (PEL). If an operator has taken additional samples which indicate possible compliance, MSHA will resample with an additional single sample and if that sample is in compliance, MSHA will accept that the violation has been abated. If routine and usually effective steps do not achieve compliance despite use of feasible controls, the operator may request that MSHA assign the mine for a technical compliance evaluation. That evaluation will include a mine visit, observation of mining equipment, including installed controls, and multiple samples to determine what additional feasible steps will achieve compliance or achieve substantial reductions. If you have already received a site visit from MSHA's Technical Support, an abbreviated evaluation will be conducted.

Where controls are infeasible, do not produce significant reductions in DPM exposures, or do not reduce exposures to the required limit, MSHA will require the operator to

provide respiratory protection for the affected miners and to implement a respiratory protection program that complies with ANSI Z88.2-1969. The mine operator must maintain the respiratory protection program until the engineering and administrative controls are in place and their adequacy is verified through MSHA resampling. In these situations, the inspector will evaluate the respiratory protection program to insure it complies fully with ANSI Z88.2-1969 and provided that miners are wearing respirators equipped with filters that meet one of the following: 1) Certified by NIOSH under 30 C.F.R. Part 11 as high efficiency particulate air (HEPA) filter; 2) Certified by NIOSH under 42 C.F.R. Part 84 as 99.97% efficient; or 3) Certified by NIOSH for DPM.

57.5065(a) and (b)--The inspector will check fuel purchase records to verify the fuel used is low sulfur. The inspector will also check any fuel additives to verify they are registered with the US EPA.

57.5066(a), (b), and (c)--The inspector will observe diesel powered equipment in operation for obvious signs of inadequate maintenance, such as heavy smoke that is unusual for that piece of equipment or obvious defects in the exhaust or emission control systems. The inspector may check shop areas to discuss diesel engine maintenance with miners authorized to conduct maintenance and to look at equipment and engine maintenance manuals. The inspectors will want to see the tags used for emission tagging, to talk with a few equipment operators about the mine's emissions tagging procedures, and to look at the maintenance log of the mine's emission tags.

If the miners authorized to conduct diesel engine maintenance appear to the inspector to lack appropriate knowledge and skills related to diesel maintenance, or if there appear to be serious maintenance-related problems with the diesel powered equipment in operation, the inspector may ask to see evidence of diesel engine maintenance training or experience for those miners. The training required would be that which is commensurate with the maintenance task involved. If examining and, if necessary, changing a filter or air cleaner is all that is required, a miner who has been shown how to do these tasks would be qualified by virtue of training or experience to do those tasks. For more detailed work, specialized training or additional experience would be required. Training by a manufacturer's representative, completion of a general diesel engine maintenance course, or practical experience performing such repairs could also serve as evidence of having the qualifications to perform the service.

In practice, the appropriateness of the training or experience of the maintenance personnel will be revealed by the performance of the equipment, both the diesel engine itself and any emission aftertreatment devices. If MSHA finds a situation where maintenance appears to be shoddy, where the log indicates an engine has been in for repair with more frequency than should be required, or where repairs have damaged engine approval status or emission control effectiveness, MSHA would ask the operator to provide evidence that the person(s) who worked on the equipment was properly

qualified by virtue of training or experience. If serious problems relating to maintenance procedures or the qualifications of miners authorized to perform maintenance are suspected, the inspector may ask for on-site assistance from a diesel engine specialist from MSHA Technical Support in complex situations.

57.5067(a) and (b)--The inspector will verify that any diesel engines introduced into the mine since September 2002 are compliant, meaning they are either MSHA Approved or meet or exceed the emissions requirements listed in Table 57.5067-1, or satisfy any of the conditions listed in 57.5067(b)(2) or (b)(3).

57.5070 (a) and (b)--The inspector will verify that DPM training has been conducted as required, and will want to see related training records.

57.5071(a), (b), (c), and (d)--The inspector will want to know how the mine operator conducts environmental monitoring for DPM exposure, and to look at environmental monitoring records. The inspector will check with the miner's representative and a few miners to verify that they have been given the opportunity to observe such monitoring, if they so choose. The inspector will check to insure that monitoring results and corrective actions, if necessary, are posted as required, and that corrective actions, if necessary, are initiated and completed as required.

Detailed information on each of these items is provided in this Compliance Guide.

§57.5060(a), INTERIM CONCENTRATION LIMIT

12. What is the interim concentration limit for DPM?

The interim concentration limit for DPM is 400 micrograms of total carbon per cubic meter of air expressed as "400_{TC} $\mu g/m^3$."

13. When will MSHA begin to enforce the interim limit for DPM?

MSHA will begin issuing citations for failure to comply with the interim limit of 400_{TC} $\mu g/m^3$ beginning July 20, 2003.

14. Can I apply for an extension of time in which to comply with the interim limit?

You will not need to apply for an extension. MSHA recognizes that in some cases, individual mine operators, particularly some small operators may have difficulty in achieving full compliance with the interim limit immediately due to feasibility constraints. Mine operators may indicate these circumstances to the MSHA inspector during regular inspections of the mine. In response, MSHA will sample miners' DPM exposures. If miners are overexposed, the agency will then assess whether it is

economically and technologically feasible to reduce the miner's exposure to the interim limit. If based on the inspector's evaluation of circumstances at the mine, the inspector believes that it is infeasible to reduce a miner's exposure to the interim limit, the inspector will initiate review of the matter by the field office supervisor and the district manager. If the district manager finds that compliance is infeasible, and the mine operator has implemented a respiratory protection program that complies with the minimum requirements established in §57.5005 (a) and (b), the district manager will issue a letter to the operator confirming the same and advising the operator that unless circumstances affecting feasibility change at the mine, MSHA will not take enforcement action against the operator regarding the miner's overexposure for a period of one year. Under an extension, mine operators must continue to use and maintain existing engineering and administrative controls and supplement these controls with appropriate respiratory protection. MSHA does not intend for the 1-year period of extensions to be considered as the period of abatement that the Agency will establish for noncompliance citations. MSHA intends for abatement time frames to continue to be determined by the specific circumstances at each mine.

For purposes of determining feasibility of engineering and administrative controls, MSHA will assess both the technological and economic feasibility of reducing a miner's exposure to the interim DPM limit. Both technological and economic feasibility will be considered by MSHA in determining if controls are feasible. MSHA will apply the same test as established by the Mine Safety and Health Review Commission (Commission) in ruling that a noise control is considered feasible when it:

- reduces exposure;
- is technologically achievable; and
- is economically achievable.

Consistent with Commission case law, MSHA considers three factors in determining whether engineering controls are feasible at a particular mine: (1) the nature and extent of the exposure; (2) the demonstrated effectiveness of available technology; and (3) whether the committed resources are wholly out of proportion to the expected results. A violation under the final standard would entail MSHA determining that a miner has been overexposed, that controls are feasible, and that you failed to install and maintain such controls.

The Commission further ruled that a control need not reduce exposure below the PEL in order to be feasible, as long as there is a significant reduction. Sometimes, however, a single control may achieve less than a significant reduction and still be considered feasible if its use, in combination with other controls, achieves a significant reduction.

15. If the purpose of the rule is to limit a miner's exposure to DPM, why does the standard restrict the concentration of total carbon?

MSHA is unaware of an appropriate sampling and analytical method that can accurately and precisely measure field samples of whole DPM at the concentrations required for compliance determinations. MSHA therefore measures miners' exposures to DPM by analyzing samples for a component of DPM that can be accurately and precisely measured. The component of DPM that MSHA will analyze, called the "surrogate," is total carbon (TC). MSHA found that when low sulfur diesel fuel is used, whole DPM is consistently between 80 and 85 percent TC. MSHA will determine compliance with the TC limit by conducting full-shift personal sampling of affected miners. TC samples that exceed the interim limit will be confirmed by evaluating the elemental carbon component of the TC (as described in the next Q&A).

16. How will MSHA determine a miner's overexposure to the interim total carbon standard?

MSHA will employ an enforcement policy for the interim concentration limit pursuant to the DPM settlement agreement. The agency will use elemental carbon (EC) to ensure that a citation based on the 400 micrograms per cubic meter of air limit of TC is valid and not the result of interferences.

Therefore, MSHA will measure TC by taking a miner's full-shift personal sample. If the result of the TC measurement is above the interim limit of 400 micrograms plus the error factor, MSHA will look at the EC measurement from the same sample, obtained through the NIOSH 5040 method, and multiply EC by a factor of 1.3 to produce an estimate of TC without interferences.

The carbon in diesel soot is present in two forms: elemental carbon and organic carbon. The analytical method that MSHA uses for DPM analysis is capable of individually measuring both the elemental and organic carbon captured on the sample filter. The sum of the elemental carbon and organic carbon (OC) is total carbon.

An example of how MSHA will determine an overexposure of the interim DPM limit follows:

400 micrograms TC limit enforced as a PEL and confirmed with an EC analysis. Single personal sample will trigger a violation.

TC result as determined by EC + OC is **below [400 x error factor]** = No citation

TC result as determined by EC + OC is **above [400 x error factor] =** Multiply EC by 1.3 to produce estimated TC result without interferences. (The "1.3" represents NIOSH's determination that TC is 60%-80% EC). Therefore, If TC is over 400 micrograms per cubic meter of air (x the error factor), but EC x 1.3 is not, no citation will be issued.

17. What is the error factor?

As with all other exposure-based metal/nonmetal compliance determinations, MSHA will address uncontrollable sampling and analytical errors by allowing a margin of error before issuing a citation for exceeding the total carbon (TC) limit. MSHA has developed an appropriate error factor to account for variability in sampling and analysis from such things as pump flow rate, filters, and the NIOSH 5040 method. If the TC measurement is above 400 μ/m^3 times the error factor for TC (1.14), MSHA will look at the EC measurement from the sample, and multiply EC by a factor of 1.3 to produce an estimate of what TC should be without interferences. MSHA will then issue a citation only when the EC measurement times the multiplier exceeds 400 μ/m^3 times the error factor for EC (1.12).

18. What is meant by "interferences"?

The underground mine environment may contain other airborne sources of carbon that cannot be distinguished from DPM during sample analysis. These potential interferences include such substances as environmental tobacco smoke, oil mists from ANFO loading operations or pneumatic rock drilling, and carbonaceous mineral dust.

These potential sources of interference do not affect an elemental carbon analysis. This is why MSHA is using the elemental carbon analysis to confirm a total carbon determination. Extensive DPM sampling where interferences were not present indicated that total carbon from DPM averages about 77 percent elemental carbon and 23 percent organic carbon. MSHA will therefore multiply the elemental carbon result by 1.3 to produce a reasonable estimate of the total carbon concentration due solely to DPM.

19. What is meant by "average eight-hour equivalent full shift airborne concentration"?

"Average full shift airborne concentration" means that a miner's exposure is determined by measuring the average concentration of airborne DPM to which the miner is exposed over a full work shift, regardless of shift length. Temporary excursions above a limit are permitted from time to time during the shift, as long as the average over the entire shift is within the limit.

The term, "eight hour equivalent full shift airborne concentration," refers to MSHA's longstanding practice of "shift-weighting" when applying compliance limits for airborne contaminants to exposures that occur over a time period that is different from a standard 8-hour shift. MSHA's compliance limits are normally based on 8 hours of workplace exposure to a contaminant and 16 hours of recovery time in the absence of

the contaminant. The workplace 8-hour shift weighted average (SWA) exposure is computed as the mass of DPM on the filter divided by the 8-hour sample volume, which is 0.816 cubic meters for sample flow rate of 1.7 liters per minute.

Actual concentrations are computed using actual sampling times; the SWA is adjusted to the 8-hour shift equivalent using the following equation:

$$\text{SWA} = \text{measured concentration of DPM} \times \frac{\text{actual shift length (in minutes)}}{480 \text{ minutes}}$$

20. What are my responsibilities for installing engineering and administrative controls?

The rule requires you to install, use and maintain feasible engineering controls, and/or to implement and follow feasible administrative controls to reduce a miner's exposure to the limit.

The rule is performance oriented, however, meaning that mine operators may choose either engineering or administrative controls, or a combination of controls to reduce a miner's exposure to the interim limit. For example, if you receive a citation for a miner's overexposure, MSHA expects the mine operator to begin the abatement process by first looking at routine and usually effective steps to improve DPM exposure levels. These routine and usually effective steps may include improved maintenance, administrative controls, or implementation of a standard filter program, provided these options are feasible. If a miner's DPM exposure continues to exceed the PEL despite use of feasible engineering and administrative controls, controls are infeasible, or controls do not produce a significant reduction in the miner's DPM exposure, you must continue to use all feasible controls and supplement them with a respiratory protection program as discussed in this compliance guide. Rotation of miners, however, is not permitted for achieving compliance with the interim limit. If these adjustments do not reduce the miner's exposure to the interim limit, operators may request that MSHA assign the mine for a technical compliance evaluation. That evaluation will include a mine visit, observation of mining equipment, including installed controls, and multiple samples to determine what additional feasible steps will achieve compliance or achieve substantial reductions. If you have already received a site visit from MSHA's Technical Support, an abbreviated evaluation will be conducted. MSHA may request Technical Support assistance at any time during the process.

21. What is the difference between DPM engineering controls and administrative controls?

Engineering controls refer to controls that remove the DPM hazard from the workplace by applying such methods as substitution, isolation, enclosure, and ventilation.

Installing engine exhaust filters and cleaner burning engines, the use of special fuels or fuel additives that reduce DPM emissions, de-rating engines, providing environmental cabs with filtered breathing air, and mine ventilation system upgrades (main or auxiliary) would be examples of engineering controls.
Administrative controls refer to specified changes in the way work tasks are performed that reduce or eliminate the hazard. Speed limits, one-way travel, prohibitions on unnecessary idling or lugging of engines, restrictions on the number of engines or total engine horsepower that would be allowed to operate in a given ventilation split at any one time, and designating areas that are "off limits" for diesel engine operation or personnel travel are examples of work practice controls.

22. Is job rotation allowed for compliance with the DPM standard?

No. The DPM standard prohibits rotation of miners to achieve compliance with the interim limit.

23. Will MSHA restrict the practice of having a miner work in a job assignment that requires the miner to split their shift between surface and underground?

No, unless the split shift is established to comply with the DPM rule. MSHA recognizes that a number of mining operations routinely require their miners to work on both the surface and underground for reasons not involving compliance with DPM. MSHA would allow this practice to continue.

24. Will I need to implement a DPM control plan when I am cited for a miner's overexposure ?

No. MSHA has stayed the effectiveness of §57.5062 addressing the DPM control plan pending completion of the ongoing rulemaking to revise the 2001 existing rule.

25. What is a significant reduction?
MSHA considers a significant reduction in DPM to be at least a 25% reduction in the miner's exposure.

26. How long will MSHA give me to implement controls?

In every case, MSHA intends to establish reasonable abatement time frames for compliance. MSHA makes this decision on a case-by-case basis depending on the facts of the particular situation. For example, if a mine operator decides to utilize aftertreatment devices to reduce DPM exposure levels, MSHA would consider the amount of time required to order and receive the devices as well as the time to install and fully implement the devices.

27. If MSHA finds a miner overexposed to DPM and I have a valid purchase order for controls that have not be delivered to my mine site, will I be cited for a violation?

No. If you can demonstrate to MSHA, through appropriate documentation such as purchase orders, that you are making reasonable progress toward implementing feasible engineering and/or administrative controls that have a reasonable likelihood of achieving compliance with the interim DPM limit within a reasonable timeframe, and you have implemented a respiratory protection program meeting the requirements of ANSI Z88.2-1969 that covers all affected miners, MSHA will not conduct compliance sampling of affected miners at that time. The inspector will return to the mine to verify that adequate progress is being made toward full implementation of controls and/or to conduct DPM sampling based on the completion timeframe established by the mine operator.

Note that such efforts to implement feasible engineering and/or administrative controls for DPM do not exempt a mine operator from complying with the other provisions of the standard, such as use of low sulfur fuel and EPA-registered fuel additives, the maintenance and engine provisions, providing required DPM training, and the recordkeeping requirements.

28. Do I have to apply to the Secretary to use respiratory protection?

No, but you cannot use respiratory protection for compliance with the DPM standard until you have exhausted all feasible engineering and administrative controls.

29. When is respiratory protection required?

Respiratory protection is required as a means of compliance with the DPM standard if MSHA sampling results in a citation for DPM overexposure, and implementation of all feasible engineering and administrative controls fail to reduce exposures to the interim limit or less. Respiratory protection is also required during the period between the time a citation for DPM overexposure is issued and MSHA resampling verifies the effectiveness of engineering and administrative controls in reducing DPM exposures to or below the interim limit. The mine operator may request MSHA resample once the operator has implemented routine and usually effective steps to reduce DPM exposure levels. MSHA will resample at the operator's request to determine compliance with the PEL and terminate the citation if exposures are reduced to the PEL. Whenever MSHA requires respiratory protection, the mine operator is also required to fully implement a respiratory protection program meeting the requirements of ANSI Z88.2-1969, American National Standard Practices for Respiratory Protection.

30. What are the key elements of a DPM respiratory protection program?

Standard operating procedures must be developed for respirator use. They must cover:

a. respirator selection that is appropriate for hazards; and
b. respirator use.

Employee training: Training must include:

a. instruction in the nature of the hazard and an honest appraisal of what may happen if the respirator is not used;
b. explanation of feasible engineering and administration controls and the efforts made or being made to eliminate the need for respirators;
c. a discussion of why this is the proper type of respirator for the particular purpose, and respirator use, capabilities, and limitations; and
d. having the respirator fitted, including demonstrations in how the respirator should be worn, how to adjust it, and how to determine if it fits properly.

Respirator cleaning and disinfecting: The program must include provision for:

a. cleaning and disinfecting respirators on a regular basis, or after each use if they are used by more than one person; and
b. for disposable respirators, a provision for employees to obtain a new respirator when theirs becomes unusable, unsanitary, or exhibits excessive breathing resistance.

Respirator storage: The program must include provision for convenient, clean, and sanitary storage.

Respirator inspection: The program must make provision for respirator inspection before and after each use and during cleaning. Deficiencies identified must be corrected.

Surveillance: The **w**ork area must be periodically checked to ensure respirator use and to monitor conditions, employee exposure, and employee stress due to breathing resistance.

Program evaluation: The respiratory protection program must be evaluated regularly to ensure continued effectiveness.

31. How long will MSHA give me to establish a respiratory protection program?

Although MSHA will make the determination based on site-specific conditions, in most cases mine operators should not take more than two weeks to implement the primary components of a respiratory protection program. These components include selecting an appropriate respirator, purchasing the required number of respirators, providing respiratory training to miners, and conducting fit testing. Mine operators must make

certain that they implement the other required components of the respiratory protection program.

32. What will MSHA do if I have begun to implement a required respiratory protection program, but before it is fully implemented, the miner's exposure is reduced to the interim limit?

If MSHA determines that the miner's exposure does not exceed the interim limit, the citation will be terminated and that miner is no longer required to wear a respirator.

33. How will MSHA determine if a citation is warranted when evaluating whether I have implemented all feasible controls?

Once you use and maintain all feasible engineering and administrative controls to reduce a miner's exposure, implement the required respiratory protection program and require the miner to use a respirator, you will be in compliance with §57.5060(a), even though a miner's DPM exposure may continue to exceed the limit and a citation will not be issued.

Keep in mind that feasibility is an MSHA determination. If the agency finds that you failed to install, use and maintain all feasible controls, or you failed to establish an appropriate respiratory protection program, you will be out of compliance.

34. If I receive a citation for a violation of the interim limit, does the miner who was overexposed need to wear a respirator even if that miner is working in a different part of the mine?

No. A citation for a violation of the interim DPM limit will specify the occupation and the area of the mine affected.

35. What are the requirements for using respiratory protection?

Respiratory protection for compliance would be permitted only after feasible engineering and administrative controls have been implemented. When respiratory protection is required for compliance with the interim limit, such use must be in accordance with a respiratory protection program that meets the requirements of ANSI Z88.2 – 1969, "Practices for Respiratory Protection." Also, you must use an air-purifying respirator equipped with filters that meet one of the following criteria:

- Certified by NIOSH under 30 C.F.R. Part 11 as high efficiency particulate air (HEPA) filter;
- Certified by NIOSH under 42 C.F.R. Part 84 as 99.97% efficient; or
- Certified by NIOSH for DPM.

36. Can I use a nonpowered, negative-pressure, air purifying, particulate-filter respirators?

Yes. Both P-series and R-series NIOSH-Approved nonpowered, negative-pressure, air purifying, particulate-filter respirators can be used, however R-series filters or respirators cannot be used for more than one work shift. N-series filters or respirators cannot be used for compliance with the DPM standard.

37. Can I use a powered air-purifying respirator (PAPR)?

Yes, if the PAPR is equipped with filters that meet one of the following criteria:

- Certified by NIOSH under 30 C.F.R. Part 11 as high efficiency particulate air (HEPA) filter;
- Certified by NIOSH under 42 C.F.R. Part 84 as 99.97% efficient; or
- Certified by NIOSH for DPM.

38. How effective are exhaust filters in reducing DPM levels?

MSHA and various other governmental and private sector organizations have conducted extensive studies of the effectiveness of various DPM control methods. MSHA conservatively estimates that hot exhaust filters are at least 80 percent efficient in removing DPM from a hot exhaust stream. MSHA laboratory data indicate that hot exhaust filters are typically 85 to 87 percent efficient, and other laboratory results obtained both in the U.S. and Europe, as well as laboratory and in-mine experiments conducted in Canada corroborate the MSHA laboratory findings. Other MSHA and NIOSH in-mine studies have demonstrated filter efficiencies up to 99+ percent. Filter efficiencies greater than 90 percent are typical for filtration of the elemental carbon fraction of DPM.

39. How effective are low emission engines for reducing DPM levels?

The DPM reduction that can be achieved by switching to a low emission engine depends on the DPM emission rates of the original and the new engine. For example, replacing an older engine that emits at the rate of 0.7 grams of DPM per brake horsepower-hour (0.7 g/bhp-hr) with a newer technology engine of the same horsepower that emits DPM at the rate of 0.07 g/bhp-hr would result in a 90 percent DPM emission reduction. A variety of engines that emit less than 0.10 g/bhp-hr of DPM are commercially available from many manufacturers over a wide horsepower range. These engines also offer better fuel economy, better maintenance diagnostics, and other operational advantages over their higher-emitting, old technology counterparts.

40. How effective are equipment cabs in reducing DPM levels?

MSHA estimates environmental cabs with filtered breathing air are from 50 to 90 percent efficient in reducing DPM exposures, depending upon the cab ventilation system airflow and filter utilized. Mine operators should be cautioned that although environmental cabs with filtered breathing air can be quite effective in limiting DPM exposures of the equipment operator, the cab affords no protection to miners working outside the cab.

41. How effective are oxidation catalytic converters in reducing DPM levels?

Oxidation catalytic converters are designed to reduce carbon monoxide and hydrocarbon emissions from diesel exhaust. These devices are not primarily designed to control DPM, and their efficiency in reducing DPM emissions is limited to around 20% or less.

42. How effective are fuel catalysts in reducing DPM levels?

MSHA has limited first-hand experience evaluating fuel pre-treatment catalysts. One fuel pre-treatment device that was subjected to limited lab testing by MSHA reduced DPM emissions by about 15%. Mine operators are encouraged to contact MSHA to obtain up-to-date information on these systems.

43. Can I rely entirely on mine ventilation to achieve compliance with the interim DPM limit?

The standard is performance oriented, meaning the mine operator may use any engineering and/or administrative control or combination of controls to achieve compliance. Ventilation alone may be sufficient to achieve compliance at some mines, depending on site-specific conditions. Other mines may need to upgrade ventilation system elements such as fans and ventilation control structures as a means of compliance, or to supplement other means of compliance in an overall DPM control strategy. Mine operators are reminded that reliance on natural ventilation may not result in consistent and on-going DPM compliance, as air flows may change significantly throughout the year with seasonal variations in outside temperature.

44. Are diesel particulate filters commercially available for underground MNM mining equipment?

A variety of filters are commercially available for all diesel engine horsepowers. For larger horsepower applications (greater than 450 horsepower), single, high-capacity filters can be used, or the exhaust can be divided into two or more separate lines, and

smaller capacity filters installed in each line. MSHA includes on its web site information on available filters for controlling DPM emissions.

45. Where can I purchase a DPM filter?

Mine operators can find information on diesel particulate filter manufacturers and suppliers on MSHA's internet web site, on internet web sites of the various filter manufacturers, or they can contact MSHA's Approval and Certification Center.

46. How do I know what type of DPM filter to purchase?

The majority of the commercially available DPM filter media are either Cordierite or Silicon Carbide. However, both filter media have similar filtering efficiencies. The ceramic media can be used directly in the engine's hot exhaust. The correct cleaning or regeneration method for the DPM filter is dependent on a machine's intended use and duty cycle, as well as the make and model of its diesel engine. MSHA strongly suggests mine operators consult with their engine manufacturer and filter supplier before making a selection. Additionally, MSHA worked with NIOSH to develop a "Diesel Particulate Filter Guide" which can be used by mine operators in decision making for filter selection. The "Filter Guide" can be found at the following MSHA Internet address: http://www.msha.gov/nioshmnmfilterselectionguide/dpmfilterguide.htm

Another significant tool for you to use is the "Best Practices." MSHA and NIOSH developed this compliance assistance tool so that you will have appropriate information on proper use and installation. These files present information based on in-mine use experience with DPM filters and can be found at the following MSHA Internet address: http://www.msha.gov/nioshmnmfilterselectionguide/dpmfilterguide.htm

Finally, NIOSH has implemented a "List Server." The list-server is a means to disseminate and share information and experiences concerning the application of available technologies for reducing miners' exposures to DPM and other gaseous emissions in underground mines. Anyone can "sign up" at no cost to share and receive information. The Internet address is posted on MSHA web site at: http://www.msha.gov/01-995/nioshlserve/nioshlserve.htm

In some cases, even a properly selected and installed filter may not function exactly as anticipated by the mine operator. For example, if a filter is selected based on the assumption that passive regeneration will occur due to a machine's heavy duty cycle, but then that machine is shifted to another job having a light or mixed duty cycle, the expected passive regeneration will probably not occur.

47. Are DPM filters suitable for retrofitting on my existing diesel powered equipment?

Yes. Commercially available diesel particulate filter (DPF) systems may be suitable for retrofitting to existing diesel-powered equipment in underground metal and nonmetal mines to effectively reduce miners' exposures to DPM. You will need to work through technical and operational situations unique to your specific mining circumstances. For example, equipment subject to heavy duty cycle operating conditions may be suitable candidates for passively regenerated filters, whereas lighter duty cycle applications would likely require actively regenerated filters.

48. How does a ceramic DPM filter work?

Several ceramic DPM filter designs have been developed. One design, referred to as a ceramic monolith type filter, consists of a "honeycomb" arrangement of long, small diameter parallel hollow ceramic-walled tubes. Alternate tubes are sealed on one end and open on the other end in a "checkerboard" pattern. The filter assembly is placed in-line into the exhaust system. DPM laden exhaust enters the open ends of the tubes and the DPM collects on the sidewalls, unable to pass through the porous filter media. The exhaust gases pass through the porous sidewalls of the tubes into the adjacent tubes, which are open only on their downstream ends. The gases exit through the exhaust pipe downstream of the filter.

49. How do you clean the ceramic type filters?

The ceramic filter collects and stores DPM. Cleaning the filter requires a source of heat to burn the DPM off of the filter media. Cleaning of the filter, referred to as "regeneration," is either accomplished by a passive, active, or combination Passive/active method.

50. What happens if a ceramic filter is not properly cleaned?

If ceramic filters are not properly cleaned (regenerated), the filter can become overloaded and clogged with DPM, thus causing excessive exhaust backpressure and possibly leading to uncontrolled combustion of the accumulated soot (uncontrolled regeneration) and destruction of the filter. The engine manufacturers specify maximum backpressure allowed on their engines. An engine warranty can be voided if the engine is operated with excessive backpressure, and ultimately, filter failure and engine damage can occur.

Uncontrolled regeneration occurs when an excessively large amount of soot in the ceramic filters starts to combust due to a sustained period of heavy engine loading followed by light engine loads. The combustion temperature rises beyond the melting point of the ceramic or a hot spot develops that either melts or cracks the ceramic.

51. What can be done to avoid uncontrolled regeneration of a ceramic DPM filter?

The magnitude of the backpressure on the engine provides an indication of the loading on the filter, so continuous monitoring of the backpressure enables users to take appropriate action to clean or remove the filter before filter overloading and resultant filter failure and engine damage occur. DPM filters are available that are provided with appropriate pressure sensors, enabling continuous monitoring of filter backpressure.

52. What is passive regeneration?

Passive regeneration means the filter is cleaned while it is installed on the machine and the machine operates through its normal work cycle. The hot exhaust gas actually causes accumulated DPM to combust. This combustion converts the solid particulates to combustion gases, which pass through the filter and out through the exhaust pipe. For passive regeneration to work properly, the exhaust gas temperature must exceed a certain minimum value for a certain percentage of the work shift, typically around 400°C to 425°C for about 25 percent of the shift.

53. Why is a catalyst usually needed for passive regeneration?

The catalyst promotes filter regeneration at a lower exhaust gas temperature, thereby facilitating passive regeneration under load conditions that would otherwise not achieve sufficient engine exhaust temperature for passive regeneration to occur. A catalyst may be added to the fuel (fuelborne) or may be coated onto a DPM filter. Filters may be coated with either a precious metal catalyst or a base metal catalyst. However, using a catalyst can only reduce the required exhaust temperature somewhat. Achieving successful passive regeneration on light duty equipment is often impossible. Filter manufacturers should be contacted for further information on specific products or users can consult the MSHA homepage at www.msha.gov.

Certain platinum based catalyzed filters can also cause an increase in nitrogen dioxide (NO_2) emissions due to the conversion of nitric oxide (NO) to NO_2. The mine operator should be aware of this when using these devices. MSHA has issued a program information bulletin on its web site addressing this issue.

54. What is active regeneration?

Active regeneration occurs when the filter is cleaned by a heat source other than the engine's exhaust gas temperature. This is normally done using an external electrical heat source, fuel additive, oven, or diesel fuel burner. Regeneration can be done while the filter is on the machine (on-board active regeneration) or the filter can be taken off the machine (off-board active regeneration) depending on the filter manufacturer's active regeneration system. Active regeneration normally requires two to four hours, and some provision for handling hot exhaust gases from the active regeneration process may be necessary. In some applications, equipment operators will need to be instructed

and trained to engage the external heat source at the end of their shifts.

55. What is passive/active regeneration?

Passive/active regeneration is a combination of both regeneration systems. For example, this has been done with base metal catalyzed traps, uncatalyzed traps with fuelborne additives, or combinations of these two systems, where the engine produces exhaust gas temperature that can burn off almost, but not quite all of the DPM. In this case, the DPM slowly builds up so that at a certain extended time interval, once every 250 hours, for example, based on backpressure or the maintenance schedule, the filter is removed for cleaning in a "regeneration station" or remains in place and is cleaned using on-board electric heaters.

56. How do I know if my machine can produce enough heat for passive regeneration?

To determine if a machine is a suitable for passive regeneration, an exhaust gas temperature trace must be performed. This is done by measuring the exhaust gas temperature with a thermocouple and a data logger during the working shift. This will indicate the exhaust gas temperature that the machine is developing during the working shift, and for how long various temperatures levels are maintained. The filter manufacturer can review this data to assist the mine operator in purchasing the correct filter with the correct regeneration system. MSHA has also posted some guidelines on this subject on their web site.

57. How often do I have to clean the filter?

Exhaust backpressure is the best indicator for determining when the DPM filter needs to be cleaned. As noted above, the engine manufacturer specifies a maximum allowable exhaust backpressure for their engine. This backpressure should never be exceeded in order to prevent engine or filter damage.

58. Where should I install the filter in the exhaust system?

The filter manufacturer should be able to assist you with exact location. For passive or passive/active regeneration filters, the filter should be installed close to the outlet of the exhaust manifold or the turbocharger in order for the filter to be exposed to the highest possible exhaust gas temperature. For active regeneration filter systems, the location is not as important since the filter does not depend on the exhaust gas temperature for heat for regeneration.

59. If I install a ceramic filter, how do I know it is working properly?

A quick qualitative check can be made by observing the engine exhaust for signs of diesel soot, especially when the engine is operating under heavy load or lugging conditions. An adequate indicator of the amount of soot being passed by the filter is available. This device samples the exhaust through a white paper filter and the "grayness" of the spot is compared to a 0 to 9 "grayness" scale.

The entire exhaust system should be checked for leaks too, especially upstream of the filter. Look for soot shadows at the joints. If the exhaust system is leak tight, and the exhaust pipe at the exit of the filter is clean on the inside, the filter is effective in reducing the ambient DPM from the machine by more than 85%. If a quantitative measure of performance is needed, the best way is to operate the equipment in an isolated zone with and without the filter installed, and sample the mine atmosphere for DPM under both conditions.

60. What do I do if I install a ceramic filter, and do everything possible to promote passive regeneration, but the filter won't passively regenerate?

Despite every effort to achieve passive regeneration, in some cases, especially light or mixed duty applications, passive regeneration is simply not possible. In these cases, the filter will need to be cleaned by other means, and this may be considered less desirable and add unanticipated cost and complexity to the process. However, users should remember that the ultimate goal of filtering diesel exhaust is to remove the DPM. As long as the DPM is removed at an acceptable efficiency, the filter is "doing its job."

§57.5061, COMPLIANCE DETERMINATIONS

61. What sampling and analytical method will MSHA use to determine compliance with the interim DPM limit?

MSHA will utilize a standard sampling pump operated at a flow rate of 1.7 liters per minute, 10 mm nylon cyclone, and a specialized submicron impactor and quartz fiber filter to obtain a personal, full-shift DPM sample that will be analyzed per NIOSH Method 5040 to determine the subject miner's average eight hour equivalent full shift exposure to airborne total carbon. MSHA has included on its website the sampling procedures used by its inspectors.

62. Are the equipment and supplies that MSHA will use for sampling DPM available to the general public?

Yes. All equipment and supplies, including the specialized DPM sampling cassettes, are commercially available.

63. Will MSHA compliance sampling be done only on the basis of personal sampling?

Yes. This will result in a permissible exposure limit (PEL) rather than a concentration limit.

64. Whom will MSHA inspectors select for DPM sampling?

MSHA inspectors will treat DPM similar to other airborne contaminants when developing a sampling strategy. Based on observations made in the mine, evaluation of the mine's ventilation plan, and knowledge of DPM emission sources, MSHA inspectors will select miners most likely to have the highest exposure to DPM. This includes miners who work underground during the entire shift, as well as miners who travel in and out of the mine during the shift, such as haulage truck drivers who pick up their load underground and dump it on the surface of the mine. MSHA will sample as many miners on as many shifts as necessary to fully document "worst case" DPM exposures at a given mine.

65. How many samples will MSHA take to demonstrate a miner's exposure?

One. To implement §57.5061(a), MSHA will consider a single personal sample an adequate basis for a compliance determination. MSHA will issue a citation as it does for all other contaminant sampling under the metal and nonmetal standards.

66. What will MSHA do if I disagree with MSHA's sampling determination?

MSHA would consider information presented by the mine operator in determining the validity of its sampling results. For example, MSHA would consider the results of simultaneous sampling conducted by the mine operator, unusual or abnormal conditions encountered during the work shift, or other factors that would raise question as to the validity of the sample. Based on the evaluation, MSHA may decide to resample.

67. How will MSHA determine when to terminate a citation for an overexposure to the DPM interim limit?

MSHA will resample to see what progress has been made to lower compliance levels at the request of an operator who has begun the abatement process by at least looking at routine steps to improve DPM exposure levels. If an operator has taken additional samples which indicate possible compliance, MSHA will resample with an additional single sample and if that sample is in compliance MSHA will accept that the violation has been abated. If routine and usually effective steps such as improved maintenance, administrative controls or the implementation of a standard filter program do not achieve abatement, MSHA, at the operator's request, will assign the mine for a technical compliance evaluation. That evaluation will include a mine visit, observation of mining

equipment including installed controls and multiple samples to determine what additional feasible steps will achieve compliance or achieve substantial reductions toward compliance. However, if Technical Support has previously evaluated the same piece of equipment in substantially similar circumstances, it will make an abbreviated evaluation of the steps needed to reasonably assure compliance.

If a mine operator requires assistance in selecting appropriate DPM controls due to unusual circumstances or especially complex conditions, MSHA Technical Support would typically be offered, in the form of a mine visit, mine ventilation system analysis, evaluation of DPM sources, observation of mining equipment including installed controls, and multiple samples to determine what additional feasible steps will achieve compliance or achieve substantial reductions toward compliance. However, if Technical Support has previously evaluated the same piece of equipment in substantially similar circumstances, it will make an abbreviated evaluation of the steps needed to reasonably assure compliance.

§57.5065, FUELING PRACTICES

68. Is low sulfur diesel fuel commercially available?

Yes. Both number 1 and number 2 diesel fuel meeting the sulfur content requirement of this rule are commercially available at local gas stations. Fuel used in over-the-road diesel engines is currently required by EPA regulations to meet the same 0.05% sulfur content limit that has been implemented for underground metal and nonmetal mines.

69. Can low sulfur fuel be differentiated by color (dyed or undyed)?

No. Undyed fuel is for on-highway use and has a low sulfur content. Dyed fuel can be either low sulfur or high sulfur (greater than 0.05%).

70. How will I know the sulfur content of the diesel fuel I purchase?

Ask the fuel distributor to give you a specification sheet that documents the fuel sulfur content. You should keep this sheet with the DPM records for your mine.

71. Can underground mines use diesel fuel for on-highway vehicles?

Yes, all diesel fuel sold in the U.S. for on-highway vehicles is low sulfur .

72. What if my fuel was purchased prior to July 5, 2001, is not low sulfur fuel and I am taking delivery over a period of time?

Prior to July 5, 2001, you were not required to use low sulfur fuel. MSHA is not going

to cite you for using fuel you purchased before the effective date of the rule.

73. Can I use bio-diesel fuel or a blend of bio-diesel and standard diesel in my underground equipment?
Yes, as long as the fuel is low-sulfur.

74. Is there an advantage to using bio-diesel fuel?

Research studies have indicated that bio-diesel fuel blends can reduce DPM emissions. The amount of DPM reduction depends on the engine used and other factors. Fifty-percent blends can reduce DPM emissions by 15 to 65 percent compared to standard diesel fuel. Bio-diesel fuel blends may damage certain fuel system components unless proper precautions are taken in advance, so mine operators are urged to consult with their engine and equipment manufacturer before switching fuels. Mine operators should also be cautioned that use of bio-diesel fuels or fuel blends may result in elevated NO_2 levels.

75. Why must I use fuel additives that are registered by the EPA?

Using a fuel additive that has not been thoroughly tested and registered with the EPA may increase DPM concentrations or expose miners to other toxic contaminants.

76. How can I determine whether an additive I wish to use is registered with the US EPA ?

Mine operators should ask the supplier of the additive for evidence that the additive is registered with the US EPA. Operators can check the status of any fuel additive directly by referring to the following EPA Internet website:
http://www.epa.gov/oms/regs/fuels/additive/web-dies.txt
Operators can also ask their MSHA inspector or check with MSHA Technical Support with questions regarding diesel fuel additives.

77. May I use diesel fuel blended with ethanol?

At the time this Compliance Guide was issued in July 2003, ethanol was not registered with the US EPA as a diesel fuel additive. Therefore, ethanol-blended diesel fuel cannot be used in underground MNM mines at this time. MSHA is aware that laboratory testing and other efforts have been initiated to register oxygenated diesel fuels, including an ethanol-diesel blended fuel. Mine operators are encouraged to consult with MSHA, or to check either the MSHA or EPA internet web sites to find out whether such a blended fuel has been registered with EPA before using such fuel in the future in their underground equipment.

§57.5066, MAINTENANCE STANDARDS

78. Is equipment that is maintained or repaired off-site and then brought back to the mine still subject to the maintenance requirements of the standard?

Yes.

79. In what condition must I maintain my diesel engines?

MSHA approved engines must be maintained in approved condition, emission related components of non-approved engines must be maintained to manufacturer specifications, and emission control devices must be maintained in effective operating condition.

80. What are the important items to look at on an MSHA-approved engine?

The important features of a MSHA approved engine are the emission-related components. These components include the piston, cylinder head, valves, fuel pump and governor, injectors, and turbocharger (if applicable). Engine settings, such as fuel injection pump settings, governor settings, and injection timing, can all adversely affect emissions. Specifications that derate the engine for altitude must be followed. Locks and seals must not be removed except by a person qualified to work on fuel pumps that can reinstall a seal or lock.

81. What items must be maintained on a diesel engine that is not MSHA approved?

Emission related components of engines that are not MSHA approved must be maintained according to manufacturer specifications. These are basically the same components which MSHA examines for "approved" engines.

82. Will an MSHA inspector require me to tear down an engine to verify that all maintenance is performed in strict accordance with the standard?

No. However, if it becomes evident during an inspection that engines are not being maintained to the correct specifications, an inspector may discuss maintenance procedures with the person performing maintenance and ask to see the manuals to confirm that the right manuals are being used.

83. Why should the miner operating a piece of diesel equipment be authorized and required to tag a machine for a suspected emissions related maintenance problem?

Diesel engine exhaust emissions, especially carbon monoxide, carbon dioxide, and DPM, are normally higher when the engine is operating at full load. Since engines are seldom operated under heavy load in the shop, a shop mechanic may be unaware of an emissions related engine fault on a machine, or a problem with an emissions control

system that occurs only when the machine's engine is under full load. Since the fault may only be seen when the engine is heavily loaded, the machine operator might be the best person to detect it.

Examples of problems that could be missed by a mechanic are black smoke coming from the outlet of the exhaust system or leaking around exhaust joints upstream from a control device. The black smoke may only be visible when the engine is being worked hard. During light loads or idle, the black smoke may not be evident due to the excess air in the combustion system (lower fuel:air ratio).

A system of tagging machines with suspected emission problems does not depend on potentially unreliable word-of-mouth communication. A visible tag will also alert other miners who might subsequently use the machine that a potential emission problem might exist.

84. What is the meaning of the term "evidence" as it is used in the standard relative to the conditions that would constitute sufficient cause to tag a piece of diesel equipment having a suspected emissions related maintenance problem?

MSHA has defined "evidence" in the context of this provision to mean visible smoke or odor that is unusual for that piece of equipment under normal operating procedures, or obvious or visible defects in the exhaust emissions control system or in the engine affecting emissions.

85. Would black smoke being emitted by a machine that is equipped with a DPM filter constitutes "evidence" of a maintenance-related emissions problem that could be tagged by an equipment operator?

Yes, if visible smoke is unusual for that piece of equipment under normal operating procedures.

86. What is the meaning of the term "promptly" as it is used in the standard relative to how soon a tagged piece of diesel equipment would need to be examined by an authorized person?

MSHA has defined "promptly" in the context of this provision to mean before the end of the next shift during which a qualified mechanic is scheduled to work.

87. Does a piece of diesel equipment that has been tagged for a suspected emissions related maintenance problem have to be immediately removed from service?

No. This requirement is different from MSHA 57.14100(c) regulation that requires self-propelled mobile equipment to be taken out of service if safety defects make continued operation hazardous. The piece of equipment must be examined before the end of the

next shift during which a qualified mechanic is scheduled to work, and will need to be removed from service, at least briefly, for that examination.

88. What information needs to be included on this DPM emissions tag?
The only requirements are that the tag indicates a possible emissions problem related to engine maintenance, and that the tag be dated. The requirement is performance oriented, and any system that conveys the required information would be acceptable. The specific nature of the maintenance problem need not be included on the tag. For example, a mine may choose to use color coding, so that whenever a dated tag of the specified color is attached to a piece of equipment, it means the operator believes a possible emissions problem related to engine maintenance exists on that piece of equipment.

89. What is the meaning of the term "qualified" as it is used in the standard relative to persons authorized by the mine operator to maintain diesel equipment?

The term, "qualified" means the person performing a maintenance task must have training or experience commensurate with the maintenance task performed.

90. Will MSHA check the qualifications of persons performing maintenance if there does not appear to be a maintenance problem affecting DPM emissions?

No.

91. If a piece of diesel-powered equipment requires frequent maintenance, will MSHA automatically cite a mine operator for having an unqualified person perform maintenance?

No. The fact that an engine requires frequent maintenance does not necessarily mean that maintenance was performed by an unqualified person.

92. What evidence does an operator have to have to show a person is qualified to perform specific maintenance tasks on diesel equipment?

The standard does not specify the type of record that is required. A record of employment experience or a certificate of training would be appropriate.

93. If an independent contractor performs diesel-powered equipment maintenance, does the person performing the maintenance need to satisfy the same qualification requirements as a person employed by the mine operator?

Yes, if the diesel-powered equipment is used in an underground metal or nonmetal mine.

94. Do these maintenance standards apply <u>only</u> to MSHA approved and engines that

meet or exceed the applicable EPA particulate matter emission requirements outlined in Table 57.5067-1)?

No. These maintenance standards apply to all diesel engines used in the underground areas of metal and nonmetal mines.

§57.5067, ENGINES

95. Does my existing fleet of diesel equipment and engines have to meet the new requirements of the standard?

MSHA conducted an inventory of diesel engines at each underground metal and nonmetal mine. This inventory was completed in September 2002. The purpose of this inventory is to enable MSHA inspectors to determine which engines are newly introduced. Engines introduced after September 2002 must either be MSHA Approved or comply with the EPA specified emissions limits contained in Table 57-5067-1.

By introduced, MSHA means any engine added to the underground inventory of engines of the mine in question. This includes engines in newly purchased equipment, engines in used equipment brought into the mine, and replacement engines that have different serial numbers from engines they are replacing.

MSHA does not consider certain engines that are brought into a mine to be "introduced" for purposes of enforcing the engine standards. These exceptions include engines that were previously part of a mine's inventory, but were removed, rebuilt, and then returned to the same mine (but only if the engine retains the same serial number), and engines that are transferred into an underground mine from a different underground mine operated by the same mine operator.

96. Do the engines in customer vehicles, delivery vehicles, or contractor vehicles that enter my mine need to be MSHA Approved or meet or exceed the particulate matter emission requirements outlined in Table 57.5067-1?

Delivery and customer vehicles are not covered by the engine or maintenance requirements of this standard. Independent contractor vehicles and equipment will be considered on a case by case basis. Independent contractor vehicles and equipment that enter into a mine on an infrequent, irregular, or nonrecurring basis would not be considered to be a part of that mine's diesel equipment fleet, and would therefore not be covered under the engine requirements of this standard.

Independent contractor vehicles that enter a mine on a frequent, regular, and recurring basis would be considered part of that mine's diesel equipment fleet, and would therefore be covered under the engine requirements of this standard.

97. Do engines in equipment that is operated by a mine development contractor for such jobs as shaft sinking or driving a slope, and that may be used in a given mine for a year or more, need to be MSHA Approved or meet or exceed the particulate matter emission requirements outlined in Table 57.5067-1?

Such mine development contractors' equipment is not considered to be part of a mine's inventory of equipment, and therefore, this equipment does not need to be Approved or meet or exceed the particulate matter emission requirements outlined in Table 57.5067-1. However, these contractors are considered to be mine operators under the Mine Act, and they must therefore comply with the other provisions of the rule, such as using low sulfur diesel fuel, providing DPM training to affected miners, and conducting DPM environmental monitoring. The contractor's employees are also subject to being sampled by MSHA for compliance with the DPM interim limit.

98. Does surface equipment that is stored underground (e.g. during the winter months) have to be compliant?

No. The rule applies only to equipment that is used underground and is therefore part of the underground equipment inventory.

99. Does surface equipment that is taken into an underground repair shop (with a mine ID) have to have a compliant engine?

No. The rule applies only to equipment that is used underground and is therefore part of the underground equipment inventory.

100. How will MSHA determine <u>when</u> a non-approved, non-EPA compliant engine was "introduced" underground for determining compliance with §57.5067(a)?

MSHA conducted a physical inventory of engines at every underground MNM mine, which was completed in September 2002. Any engine entered onto this inventory will be considered compliant with §57.5067(a)(2). Engines introduced after September 2002 need to be MSHA Approved or meet or exceed the particulate matter emission requirements outlined in Table 57.5067-1.

101. If I transfer an engine from one underground mine to another underground mine operated by the same mine operator, does it need to be MSHA Approved or meet the EPA DPM emission specifications contained in Table 57.5067-1?

Section 57.5067(b)(3) allows an engine to be transferred from one underground mine to another underground mine operated by the same mine operator without being considered "introduced" into the inventory of engines for that mine. However, if the

engine was introduced into the first mine after the inventory of engines at that mine, it would have to be MSHA Approved or meet the relevant EPA emissions requirements from Table 57-5067-1 regardless of whether it is operated in that mine or transferred to another mine operated by the same mine operator.

102. Can an engine that is not MSHA Approved and does not meet the relevant EPA emissions requirements from Table 57.5067-1 be transferred from an underground mine in another country to an underground mine in this country if both mines are operated by the same mine operator ?

No. The inventory of engines is completed.

103. Are there exemptions from the engine or maintenance requirements for non-production equipment like personnel transports, fuel and lube trucks, utility vehicles, and welding trucks?

No. Only ambulances and fire fighting equipment that are used in accordance with the mine's fire fighting and evacuation plan are excluded from the engine requirements of §57.5067.

104. Can I introduce a non-compliant engine (an engine that is not MSHA Approved and does not meet the relevant EPA emissions requirements from Table 57-5067-1) if the engine is provided with a DPM filter such that the filtered exhaust meets the relevant EPA emissions requirements from Table 57.5067-1?

No. The emission requirements apply to the engine itself, not to the engine plus devices installed on the equipment on which the engine is used.

105. What is an MSHA Approved engine?

A diesel engine that is approved under Part 7 or Part 36, Title 30 Code of Federal Regulations (C.F.R.) is considered an approved engine.

106. Can an engine certified under MSHA's old approval program, 30 C.F.R. Part 32 (schedule 24), be introduced into the mine?

Not on the basis of it being an MSHA Approved engine. This standard defines MSHA Approved as an engine that is approved under Part 7 or Part 36, Title 30 Code of Federal Regulations only. If the engine in question meets or exceeds the relevant EPA emission requirements listed in Table 57.5067-1, that engine could be introduced into the underground areas of a mine on that basis, but not on the basis of its being MSHA Approved.

107. Where can a list of MSHA approved engines be found?

MSHA lists all approved engines on their homepage at:
http://www.msha.gov/S&HINFO/DESLREG/1909a.HTM

108. How do I know if a given diesel engine is MSHA Approved?

MSHA Approved engines have an MSHA approval tag attached to the engine. The approval tag lists the engine's approval number and other pertinent information. The engine manufacturer issues the tag when the engine is sold. The engine manufacturer may be contacted to provide a tag for an engine as long as the engine is built to the MSHA approval specifications for that engine model.

109. How do I know if a given diesel engine meets the necessary EPA DPM emission specifications?

MSHA will accept an engine with an EPA label if the information on the label matches the requirements in Table 57.5067-1 of §57.5067. If the engine does not have an EPA label, the engine manufacturer should be contacted to determine if the engine meets the PM limits specified in the table.

110. Is "tailpipe" emission testing required at the mine site?

No. The mine operator is not required to conduct "tailpipe" emission testing, and MSHA will not conduct such testing to determine engine emission compliance. However, a mine operator may wish to conduct such testing as a maintenance diagnostic tool, or as a way to identify "problem" equipment.

§57.5070, MINER TRAINING

111. Who needs to receive DPM training?

All miners "who can reasonably be expected to be exposed to diesel emissions" in the underground areas of a mine are required to be trained.

112. Am I required to give DPM training to miners who work on the surface at an underground mine?

No, unless those miners can reasonably be expected to be exposed to diesel emissions in the underground areas of a mine.

113. Do surface miners that occasionally drive equipment into an underground mine need to receive DPM training?

No.

114. Do employees of independent contractors, customer truck drivers, and delivery truck drivers need to be trained on DPM?

Certain independent contractors are mine operators and must be trained on DPM. Delivery truck drivers and customer truck drivers are not covered by the training provisions of this standard, but they should be provided with information on DPM exposure hazards as a part of hazard training under MSHA's comprehensive training standard.

115. When should initial and annual DPM training be provided?

Initial training should have been provided before July 5, 2001, the effective date of the training provision. For new miners, such training must be provided prior to his/her assignment to work that may expose the miner to DPM. Annual training must be provided within every 12 months thereafter.

116. What topics have to be covered in DPM training?

- the health risks associated with exposure to diesel particulate matter;
- the methods used in the mine to control diesel particulate matter exposures;
- identification of the personnel responsible for maintaining those controls; and,
- the actions miners must take to ensure the controls operate as intended.

117. Is there a required format for DPM training?

No. The rule places no constraints on the operator as to how to accomplish this training. Instruction could take place at safety meetings before the shift begins. Providing miners with a copy of MSHA's "Toolbox" and holding one-on-one discussions that cover the required topics is another approach that can be used. The Toolbox is available on MSHA's website:
http://www.msha.gov/S&HINFO/TOOLBOX/TBCOVER.HTM

118. Can DPM training be combined with Part 48 training?

Yes, but it doesn't have to be.

119. If DPM training is combined with Part 48 training, do I need to submit a Part 48 training plan modification to the District Manager?

Yes.

120. Do I need to retain a record of DPM training?

Yes, for 1 year after completion of training.

121. If I provided initial DPM training for a new miner on September 1, 2001, what is the latest date that miner may receive annual DPM training?

September 30, 2002.

122. Must training be given by MSHA-approved instructors?

No. The rule does not specify instructor qualifications. However, if DPM training is combined into Part 48 training, the Part 48 regulations regarding MSHA-approved instructors would apply.

123. Where can I get assistance with DPM training?

These Questions/Answers can be used in miner training, as well as the 1997 MSHA publication, "Practical Ways to Reduce Exposure to Diesel Exhaust in Mining – A Toolbox." The Toolbox is available on MSHA's website: http://www.msha.gov/S&HINFO/TOOLBOX/TBCOVER.HTM
Assistance is also available through MSHA's Educational Field Services.

§57.5071, ENVIRONMENTAL MONITORING

124. What is the purpose of environmental monitoring for DPM?

Mine operators are required to conduct environmental monitoring for DPM for several reasons. Environmental monitoring enables the mine operator to determine whether DPM concentrations are in compliance with the interim DPM limit on a continuing basis. The mine operator can use the information gathered through monitoring to determine whether corrective action is necessary to achieve or maintain compliance and to assess the ongoing effectiveness of DPM control measures. This requirement also ensures special attention will be focused on conditions most likely to result in overexposure to DPM.

125. How often do I need to conduct environmental monitoring for DPM concentrations?

A specific DPM monitoring schedule is not included in the standard. Mine operators are required to monitor as often as necessary to verify continuing compliance. Once compliance has been verified, MSHA would not anticipate that extensive additional monitoring would be required. However, if conditions affecting DPM emissions or in-mine DPM concentrations change significantly, such as by the addition of new

equipment or changes in the ventilation system, the mine operator would be expected to verify that these changes have not resulted in any DPM overexposures. Generally, once monitoring has verified that these changes have not caused the interim limit to be exceeded, the mine operator could likely return to the practice of occasional spot checking.

126. Who can observe operator monitoring, and does MSHA restrict the number of persons observing monitoring?

The opportunity to observe monitoring extends to both miners and their representatives. MSHA does not intend to limit the number of miners who may observe monitoring.

127. Will I be paid for observing the operator's monitoring?

No. Section 103(f) does not authorize "walk around pay" for time spent by a representative of miners observing a mine operator's monitoring program.

128. Do I need to monitor my mine environment for DPM using the same method MSHA will use for compliance determinations (respirable dust sampler equipped with a submicron impactor, analyzed for total carbon using the method described in NIOSH Analytical Method 5040)?

No. This requirement is performance oriented, and any method that would indicate whether compliance with the interim limit is being maintained on an on-going basis would be acceptable.

129. What other methods are available for DPM monitoring? What are their advantages and disadvantages?

Generally, the advantages of using a method other than that specified for compliance determinations in the standard are simplicity and cost. Three alternatives to MSHA's compliance sampling and analytic method are summarized below:

Sampling can be conducted as specified for MSHA compliance, but without the cyclone or specialized submicron impactor. Analytical results may be influenced by mineral dust interference, and would probably indicate higher DPM levels than would have been the case using the cyclone and impactor.

Sampling can be conducted as specified for MSHA compliance, but sample analysis can be gravimetric (by weight) instead of employing the thermo-optical method of analysis specified in NIOSH Method 5040. Since the impactor removes all particulates greater than 0.9 μm in size, all non-DPM particulates are removed before reaching the filter. A

disadvantage of the gravimetric approach is that it is less accurate at low DPM concentrations than thermo-optical analysis.

Another common DPM sampling and analytic method is the RCD method. RCD refers to respirable combustible dust. In this method, a respirable dust sample is collected, weighed, heated to 400° C in an oven to burn off all carbonaceous material (including DPM), and then weighed again. The difference in weight pre- and post-heating represents the DPM collected on the filter. Since this method relies on weighing for analysis, its accuracy is limited at low DPM concentrations.

130. How do I convert a time weighted average concentration to a shift weighted average concentration for comparison to MSHA compliance sampling results?

When DPM concentrations have been computed using the actual sampling times, the result is a time weighted average (TWA) concentration. This is the form that commercial industrial hygiene laboratories usually report analytical results. To convert a TWA concentration to a shift weighted average (SWA) concentration, the TWA is multiplied by the ratio of actual shift length (in minutes) to the 8-hour shift equivalent (480 minutes) using the following equation:

$$\text{SWA} = \text{TWA of DPM as measured} \times \frac{\text{actual shift length (in minutes)}}{480 \text{ minutes}}$$

131. Would area sampling be considered an acceptable sampling strategy for compliance with the environmental monitoring provisions ?

Yes, provided the area sampling provides reasonable assurance that no miner's personal exposure to DPM exceeds the interim limit.

132. Will MSHA issue a citation for a miner's overexposure based on the mine operator's sampling results?

No. MSHA's citations for a miner's overexposure to DPM will be based on an MSHA sampling result. MSHA may use an operator's sampling results as the basis for other enforcement action. For example, if an operator's sampling results indicate that a miner was overexposed but the operator failed to take corrective action by the next work shift, as required by §57.5071(c), MSHA would issue a citation for violating that standard.

133. Are there any commercial analytic laboratories that are equipped to analyze DPM samples for total carbon in accordance with the method described in NIOSH Method 5040?

Yes. At the time this Compliance Guide was written, MSHA was aware of at least 6 commercial industrial hygiene laboratories that were equipped to analyze DPM

samples per the NIOSH Method 5040. MSHA's Internet web site provides a list of commercial laboratories that provide analytical services per NIOSH Method 5040.

134. What do I need to do if my environmental monitoring results indicate that any of my miners have been exposed to DPM concentrations that exceed the interim concentration limit?

If a mine operator's sample results indicate that the interim limit has been exceeded, the operator must promptly post a notice indicating the corrective action to be taken, the corrective action must be initiated by the next shift, and the corrective action must be promptly completed.

135. Do I have to post the results of sampling each miner even if there is no overexposure?

Yes. MSHA intends for mine operators to post monitoring results for all affected miners, including those results from MSHA sampling.

136. What is meant by the term "promptly" that is used twice in §57.5071(c)?

Promptly means without delay. In the context of posting notice, promptly means the mine operator must post notice as soon as it has been decided what corrective action will be taken. Since the corrective action must be initiated by the next work shift, the time frame for posting notice is quite short.

In the context of completing the corrective action, promptly means that fully implementing the corrective action cannot be delayed. The time frame for completing the corrective action depends on the nature of the action being taken. For example, retraining a miner on proper work practices to reduce DPM emissions may not take as long as retrofitting a new, low emission engine on a piece of equipment. Whatever the action taken, it must not be unduly delayed.

§57.5075, DIESEL PARTICULATE RECORDS

137. What records do I need to keep, and for how long?

Record	Section reference	Retention time
1. Approved application for extension of time to comply with exposure limits.	57.5060(c)	Duration of extension
2. Purchase records noting sulfur content of diesel fuel	57.5065(a)	1 year beyond date of purchase
3. Maintenance log	57.5066(b)	1 year after date any equipment is tagged

4. Evidence of competence to perform maintenance	57.5066(c)	1 year after date maintenance performed
5. Annual training provided to potentially exposed miners	57.5070(b)	1 year beyond date training completed
6. Record of corrective action	57.5071(c)	Until the citation is terminated
7. Sampling method used to effectively evaluate particulate concentration, and sample results	57.5071(d)	5 years from sample date

138. Do the records have to be kept at the mine?

Records do not have to be kept at the mine site, but if they are maintained off-site, they need to be immediately accessible at the mine site by electronic transmission.

139. Once MSHA requests DPM records, how much time will I be given to provide them?

MSHA expects mine operators to be diligent in providing required records. Records are important in guiding inspection decisions. There must be no unnecessary delay in providing them. If the records are maintained at an off site location, whether in hard copy or electronic format, they must be accessed from the mine site by electronic file transfer, e-mail, fax, or similar means.

140. How do I obtain compliance assistance from MSHA on this rule, including DPM control methods and sampling?

Mine operators, miners, miner's representatives, and independent contractors who work on mine property can check MSHA's Internet web site (www.msha.gov) for a variety of compliance assistance materials such as a list of Approved engines, a list of particulate filters for installation on diesel engines (with filter efficiencies), Program Information Bulletins and Policy Letters, and information on DPM sample cassettes with integral submicron impactor. Other information that is available specifically for this standard includes the "Estimator" (a computer spreadsheet program that permits the user to estimate the effectiveness of proposed, user specified DPM controls). MSHA has developed a trouble-shooting guide, a decision tree to aid in the selection of filters, examples of written compliance strategies, and other aids. MSHA's Internet site also has links to other sites containing useful information, such as those of NIOSH and EPA.

Requests for compliance assistance on this or any MSHA standard may also be made directly to any MSHA Metal and Nonmetal Inspector, Field Office, District Office, national office, MSHA Educational Field Services, or MSHA's Office of Technical Support.